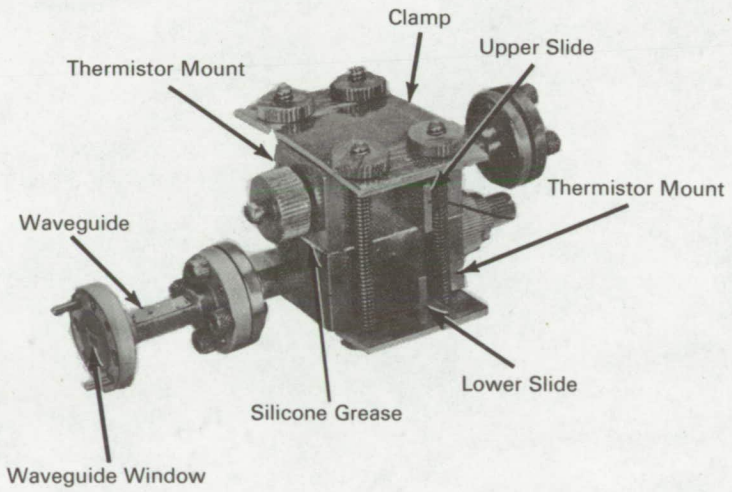
NASA TECH BRIEF

MM-Wave Power Meter Mount



The problem:

In power measurement applications in the mm-wavelength region, commercially available mounts are not useful for precision measurements above a frequency of 40 GHz. Power measurements above this frequency can be performed by using a waveguide transition section to match an available R-band mount to the E-band flange but only with resultant poor sensitivity and narrow band performance. The E-band thermistor mounts that are commercially available consist of only one power detection thermistor and are too strongly affected by changes in mount temperature to make accurate measurements. In addition, these mounts are not electrically compatible with modern commercial power meters.

The solution:

An E-band thermistor mount for measuring RF power in the mm-wavelength (usually 3 mm) and a technique for adjusting a temperature compensating thermistor to provide an electrically balanced bridge. The mount is relatively insensitive to temperature effects that cause measurement errors in single ended circuits.

How it's done:

Two single commercially available thermistor mounts are thermally bonded together and wired electrically to adapt to a commercial power meter. A stainless steel waveguide section with waveguide window prevents convection currents, thus thermally isolating the power detection (left) thermistor mount. One thermistor is mounted in each slide, a temperature compensating thermistor in the upper slide and a power detection thermistor in the lower. The slides move laterally and are moved and set for maximum output on the power meter. The two thermistors form the input bridge circuit, with the detection thermistor resistance related to the magnitude of the power entering the waveguide.

(continued overleaf)

A novel technique is used to provide a thermal path or heat leak to the temperature compensating thermistor required to balance the bridge. The upper slide is masked leaving a slit in front of the thermistor leads. A fine paint spray is then drawn through by a low vacuum applied to the opposite side and coats the longer thermistor lead to form the thermal path to the slide. The thermistor is alternately monitored under the microscope and with the power meter, between spray coats, until the bridge is within the normal operating range.

Notes:

1. Used in conjunction with a commercially available insertion loss test set, this mount extended its frequency range to 100 GHz.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: B68-10152

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

Source: Charles T. Stelzried,
Donald L. Mullen, and Donald A. Oltmans
of Jet Propulsion Laboratory
(NPO-10348)